

Units: LF of Rail

This element defines all types and shapes of metal bridge railing. Steel, aluminum, metal beam, rolled shapes, etc., will all be considered part of this element. **All elements of the rail must be metal.** Report the lineal feet of railing in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of units after deducting those reported in Condition States 2 through 4.

	CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS	
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ($\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is not warranted.	3
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is warranted due to location of corrosion on the member.	4
R4	Heavy section loss ($> 30\%$ thickness loss), may have holes through base metal.	4

CDOT Notes: GCD22 - For metal bridge railing with any coated components, use Element 334 Metal Bridge Railing (Coated).

GCD23 - Flex beam rail attached to timber posts in fill over a culvert is usually considered to be a roadway railing. Railing with steel or timber posts in the fill attached to the structure is considered to be bridge railing (Element 333 Miscellaneous - Bridge Railing (Other) for timber posts).

Condition State 1 **There is no evidence of active corrosion** of the unpainted metal.

Feasible actions: 1) DN

Condition State 2 **Surface or freckled rust has formed or is forming** on the unpainted metal.

Feasible actions: 1) DN
2) Clean & paint

Condition State 3 **Surface pitting may be present** but any **section loss due to active corrosion is measurable** and does not affect the strength or serviceability of the element.

Feasible actions: 1) DN
2) Clean & paint

Condition State 4 **Corrosion is advanced. Section loss is sufficient to warrant analysis** to ascertain the impact on the ultimate strength and/or serviceability of the element.

Feasible actions: 1) DN
2) Rehab unit
3) Replace unit

Units:LF of Rail

This element defines all types and shapes of reinforced concrete bridge railing. **All elements of the rail must be concrete.** Report the lineal feel of railing in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of units after deducting those reported in Condition States 2 and 3.

CDOT Notes: Concrete bridge railing with metal components attached shall be considered Element 333 Miscellaneous - Bridge Railing (Other).

"Dog House" style bridge railing requires Element 338 Curbs/Sidewalks (Concrete) since the curb is not included in the railing element.

Concrete components on concrete rails such as noise barriers, shall be considered part of this element.

Condition State 1 The element shows no deterioration. **There may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks, surface scaling or spalls** may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN
2) Seal cracks, minor patching

Condition State 3 **Some delaminations and/or spalls may be present and some reinforcing may be exposed.** Corrosion of rebar may be present but **loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN
2) Clean rebar and patch (and/or seal)

Condition State 4 **Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN
2) Rehab unit
3) Replace unit

Units: LF of Rail

This element defines all types and shapes of timber railing. **All elements of the railing (except connectors) must be timber.** Report the lineal feet of railing in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of units after deducting those reported in Condition States 2 and 3.

Condition State 1 There is **no decay**. There may be **minor cracks, splits and/or checks**.

Feasible actions: 1) DN

Condition State 2 There **may be decay** with or without **splitting, cracking, checking or crushing** but **none is sufficiently advanced** to affect serviceability.

Feasible actions: 1) DN
2) Rehab and/or apply surface treatment

Condition State 3 Advanced deterioration. **Decay, splits, cracks or crushing has produced loss of strength** that may affect the serviceability of the element.

Feasible actions: 1) DN
2) Replace unit

Units: LF of Rail

This element defines all types and shapes of railing except those already defined as METAL, CONCRETE, or TIMBER. This element will include cable rails, combinations of timber, concrete and metal, etc. Metal portions may or may not be painted or galvanized. Report the lineal feet of railing in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of units after deduction those reported in Condition States 2 and 3.

CDOT Notes: The sum of the portions of concrete bridge rails with metal components attached is to be reported as Element 333 Miscellaneous - Bridge Railing (Other).

GCD23 - Flex beam rail attached to timber posts in fill over a culvert is usually considered to be a roadway railing. Railing with steel or timber posts in the fill attached to the structure is considered to be bridge railing (Element 333 Miscellaneous - Bridge Railing (Other) for timber posts).

Condition State 1 The element shows no signs of deterioration. There **may be minor cracking, corrosion** and/or other minor deterioration having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracking, spalls, decay of timber portions or corrosion of metal** may be present.

Feasible actions: 1) DN
2) Rehab unit

Condition State 3 Advanced deterioration. **Corrosion, decay or loss of section is sufficient to warrant analysis** to ascertain the impact on the serviceability or strength of the element.

Feasible actions: 1) DN
2) Rehab unit
3) Replace unit

Units: LF of Rail

This element defines all types and shapes of metal bridge railing. Steel, aluminum, metal beam, rolled shapes, etc., will all be considered part of this element. **All elements of the rail must be metal. It may be painted or galvanized.** Report the lineal feet of railing in each of Condition States 2 through 5. The number of units in Condition State 1 will be the remainder of units after deduction those reported in Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ($\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is not warranted.	4
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is warranted due to location of corrosion on the member.	5
R4	Heavy section loss ($> 30\%$ thickness loss), may have holes through base metal	5

CDOT Note: GCD22 - For metal bridge railing with any coated components, use Element 334 Metal Bridge Railing (Coated).

This element includes metal attachments such as debris fence and hand rail.

GCD23 - Flex beam rail attached to timber posts in fill over a culvert is usually considered to be a roadway railing. Railing with steel or timber posts in the fill attached to the structure is considered to be bridge railing (Element 333 Miscellaneous - Bridge Railing (Other) for timber posts).

Condition State 1 **There is no evidence of active corrosion.** Protective coating is sound and functioning as intended to protect the element.

Feasible actions: 1) DN

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. **Protective coating may have minor areas of deterioration.**

Feasible actions: 1) DN
2) Clean & restore coating

Condition State 3 **Surface or freckled rust is prevalent. Protective coating is no longer effective.** There may be exposed metal but there is no active corrosion causing loss of section.

Feasible actions: 1) DN
2) Clean & restore coating

Condition State 4 **Corrosion may be present but any section loss due to active corrosion is measurable and does not affect the strength or serviceability of the element.**

Feasible actions: 1) DN
2) Rehab unit
3) Replace unit

Condition State 5 **Corrosion is advanced. Section loss is sufficient to warrant analysis** to ascertain the impact on the ultimate strength and/or serviceability of the element.

Feasible actions: 1) DN
2) Rehab unit
3) Replace unit

Units: Each

This element describes concrete or masonry units at the ends of most culverts to retain the fill. They are usually vertical.

CDOT Notes: When bridge rail is attached to a headwall, the headwall element is considered to be between the top of the culvert and the bottom of the railing element.

Noise barriers or other items (for which there are no Pontis elements) may extend the height of the headwall and are considered to be part of the headwall.

This element includes saddlewalls and slope protection used at the ends of pipes.

Condition State 1 There may be insignificant cracking including hairline and light flexure or shear cracks. There may be minor scaling or small spalls without exposed reinforcement.

Feasible actions: 1) DN

Condition State 2 There may be moderate shear or flexure cracks, moderate disintegration or spalls with exposed and rusting reinforcement. There may be loose stones.

Feasible actions: 1) DN
2) Clean & patch

Condition State 3 There may be heavy shear or flexure cracks or heavy disintegration with significant loss of section to reinforcing. Stones may be missing.

Feasible actions: 1) DN
2) Clean & patch
3) Replace

Units:LF Along Centerline

This element defines the steel portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ($\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is not warranted.	4
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is warranted due to location of corrosion on the member.	5
R4	Heavy section loss ($> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the coating is sound and functioning as intended to protect the metal surface.

Feasible actions: 1) DN

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The coating may be chalking, peeling, curling or showing early evidence of coating distress but **there is no exposure of metal.**

Feasible actions: 1) DN
2) Surface clean
3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The coating is no longer effective. There **may be exposed metal** but there is no active corrosion which is causing loss of section. There is **slight deterioration in the sidewalk, but poses no hazard to pedestrians.**

Feasible actions: 1) DN
2) Spot blast, clean & paint

Condition State 4 **The coating has failed. Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of the element. There is **sufficient deterioration in the sidewalk and does pose a hazard to pedestrians.**

Feasible actions: 1) DN
2) Spot blast, clean & paint
3) Repair or minor rehab & paint

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of the element. There is **advanced deterioration of the sidewalk and should be closed to pedestrians.**

Feasible actions: 1) DN
2) Major rehab unit
3) Replace unit

Units: LF Along Centerline

This element defines the steel portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 4.

	CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS	
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ($\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is not warranted.	3
R3	Flaking, swelling, mod. section loss ($10\% < \text{thickness loss} \leq 30\%$) structural analysis is warranted due to Location of corrosion on the member.	4
R4	Heavy section loss ($> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering color is yellow orange to light brown. There is **slight deterioration in the sidewalk, but poses no hazard to pedestrians.**

Feasible actions: 1) DN
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant analysis.** Weathering steel is dark brown or black. There is **sufficient deterioration in the sidewalk and does pose a hazard to pedestrians.**

Feasible actions: 1) DN
2) Repair or minor rehab & paint

Condition State 4 Corrosion is advanced. **Section loss due to corrosion is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge. There is **advanced deterioration in the sidewalk and should be closed to pedestrians.**

Feasible actions: 1) DN
2) Rehab unit
3) Replace unit

Units: LF Along Centerline

This element defines the concrete portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 4.

CDOT Notes: Sidewalks which are at the same level of the bridge deck (with or without curbs) are to be coded as Element 338 Curbs/Sidewalks (Concrete).

Curb adjacent to a sidewalk is considered to be subsidiary to and part of Element 338 Curbs/Sidewalks (Concrete). Report one length per sidewalk.

Condition State 1 The element shows little or no deterioration. There may be discoloration, light efflorescence, and/or superficial cracking but does not affect the strength or serviceability of the element.

Feasible actions: 1) DN

Condition State 2 Minor cracks, delaminations, scale, and/or spalls may be present but no exposed reinforcing or surface evidence of rebar corrosion and does not affect the strength and/or serviceability of the element. There is slight deterioration in the sidewalk but poses no hazard to pedestrians.

Feasible actions: 1) DN
2) Seal cracks, minor patch

Condition State 3 Some delaminations, scale, and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of the element. There is sufficient deterioration in the sidewalk and does pose a hazard to pedestrians.

Feasible actions: 1) DN
2) Seal cracks, minor patch
3) Clean rebar & patch (and/or seal)

Condition State 4 Advanced deterioration. Heavy scale, and/or spalling, corrosion of reinforcement and/or loss of section is sufficient to warrant analysis to ascertain the strength and/or serviceability of the element. There is advanced deterioration in the sidewalk and should be closed to pedestrians.

Feasible actions: 1) DN
2) Rehab unit
3) Replace unit

Units: LF Along Centerline

This element defines the timber portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **no** deterioration or **decay**. There **may be superficial checks, cracks, or splits** having no effect on the strength or serviceability of the element.

Feasible actions: 1) DN

Condition State 2 **Decay, checking, splitting or cracking, or splintering from collision may exist** but not of a sufficient magnitude to affect the strength or serviceability of the element. There is **slight deterioration in the sidewalk, but poses no hazard to pedestrians**.

Feasible actions: 1) DN
2) Repair and/or protect unit

Condition State 3 **Decay, checking, splitting or cracking, or splintering and/or broken/missing portions from collision has produced loss of strength** of the element **but not of a sufficient magnitude** to affect the serviceability of the element. There is **sufficient deterioration in the sidewalk and does pose a hazard to pedestrians**.

Feasible actions: 1) DN
2) Rehab unit

Condition State 4 **Advanced decay and/or deterioration**. Splitting, cracking, splintering, or broken/missing portions (> 10' in length) has produced loss of strength and does affect the serviceability of the element. There is advanced deterioration in the **sidewalk and should be closed to pedestrians**.

Feasible actions: 1) DN
2) Replace unit

Units: Each

This element defines the colored **mortar-based acrylic concrete coating used for aesthetic treatment** of bridges. Report the condition state which most accurately represents the condition of the entire bridge.

CDOT Note: This element applies to any coating applied to the concrete elements. Colored concrete is not included.

Condition State 1 The coated concrete surfaces have **peeling, bad staining, or graffiti less than 5%** of the covered surface area.

Feasible actions: 1) DN

Condition State 2 The coated concrete surfaces have **peeling, bad staining, or graffiti between 5% and 20%** of the covered surface area.

Feasible actions: 1) DN
2) Rehab/clean coating
3) Replace coating

Condition State 3 The coated concrete surfaces have **peeling, bad staining, or graffiti greater than 20%** of the covered surface area.

Feasible actions: 1) DN
2) Rehab/clean coating
3) Replace coating

Units: Each

This element defines the **colored mortar-based acrylic concrete coating** used for aesthetic treatment of bridges. Report the condition state which most accurately represents the condition of the entire bridge.

CDOT Note: This element applies to any coating applied to the concrete elements. Colored concrete is not included.

Condition State 1 The coated concrete surfaces have **peeling, bad staining, or graffiti less than 5%** of the covered surface area.

Feasible actions: 1) DN

Condition State 2 The coated concrete surfaces have **peeling, bad staining, or graffiti between 5% and 20%** of the covered surface area.

Feasible actions: 1) DN
2) Rehab/clean coating
3) Replace coating

Condition State 3 The coated concrete surfaces have **peeling, bad staining, or graffiti greater than 20%** of the covered surface area.

Feasible actions: 1) DN
2) Rehab/clean coating
3) Replace coating

Units: Each

This condition state language addresses the condition of the attachment utilized to connect overhead signs to bridges. These attachments support overhead signs (**SIGN**, **CSIGN**, **BSIGN**, **DSIGN**, and bridge mounted signs (**BMS**)). Examine the lower portions of the vertical sign member within 4' of the attachment (referred to as the "sign connection" below) for cracks and distress. Inspect the entire frame in the case of a BMS.

CDOT Notes: Bridge components in the vicinity of the attachment are to be inspected for any signs of deterioration or distress and the condition reported with the appropriate element.

The following sentence should be modified for the situation and included in the comments for this element: "<Sign Str. No. > <A BMS> is attached to <the girder> <the bridge rail/deck> <the girder and bridge rail/deck> <a retaining wall with or without traffic railing> <the pier> of this bridge."

Condition State 1 The attachment and sign connection are not showing significant signs of deterioration.

Feasible actions: 1) DN

Condition State 2 The attachment and sign connection are showing signs of deterioration but they are not of concern at this time.

Feasible actions: 1) DN

Condition State 3 The attachment and sign connection are showing signs of deterioration and warrant analysis.

Feasible actions: 1) Perform analysis

Condition State 4 The attachment and sign connection are showing signs of severe deterioration or distress which warrant either immediate repair or removal of the attachment.

Feasible actions: 1) Immediate repair
2) Immediate removal

Units: Each

This condition state language addresses the condition of miscellaneous pole attachments connected to bridges. These attachments include **signal poles, light poles, camera poles, or any other item which utilizes a pole** that is attached to a bridge. The pole attachment **does not include regulatory traffic signs**. Examine portions of the pole within 4' of the bridge attachment (referred to as the "pole connection" below) for cracks and distress.

CDOT Note: Bridge components in the vicinity of the attachment are to be inspected for any signs of deterioration or distress and the condition reported with the appropriate element.

Condition State 1 The attachment and pole connection are not showing significant signs of deterioration.

Feasible actions: 1) DN

Condition State 2 The attachment and pole connection are showing signs of deterioration but the are not of concern at this time.

Feasible actions: 1) DN

Condition State 3 The attachment and pole connection are showing signs of deterioration and warrant analysis.

Feasible actions: 1) Perform analysis

Condition State 4 The attachment and pole connection are showing signs of severe deterioration or distress which warrant either immediate repair or removal of the attachment.

Feasible actions: 1) Immediate repair
2) Immediate removal

Units: LF Along Centerline

This element defines the formed concrete lined portions of tunnels only, it may or may not have sheet metal panels or tile walls or ventilation ducts. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **minimal deterioration** such as **hairline cracks** < 1/32", **efflorescence stains**, or **light scale** < 1/4" deep.

Feasible actions: 1) DN

Condition State 2 The element **show deterioration** such as: **Cracks** 1/32" to 1/16" in width, **efflorescence deposits** or **stalactites without dripping water**, **scale** 1/2" deep, **but no delaminations or spalls**. **Efflorescence** on the lining surface is **light to severe**, but affects **less than 10% of lining area**.

Feasible actions: 1) DN
2) Seal cracks or control water

Condition State 3 The element shows **moderate deterioration** such as: **Cracks** > 1/16" in width, **efflorescence deposits, dripping water**, **scale** to 3/4" deep, **delaminations or spalls** < 1" deep. **Efflorescence** on the lining surface is **light to severe**, but affects **10% to 25% of lining area**.

Feasible actions: 1) DN
2) Seal cracks or control water
3) Patch delaminations, spalls, or scale

Condition State 4 The element shows **severe deterioration** such as: **Cracks** > 1/4" in width, **efflorescence deposits, dripping water**, **scale** > 3/4" deep, **delaminations or spalls** > 1" deep. **Efflorescence** on the lining surface is **light to severe**, but affects **more than 25% of lining area**.

Feasible action: 1) DN
2) Seal cracks or control water
3) Patch delaminations, spalls, or scale
4) Replace concrete lining

Units: LF Along Centerline

This element defines the unlined/unsupported (rock) portion of tunnels only. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **minimal deterioration** such as: **Minimal water leakage** and the joints in the **rock** are **tight**.

Feasible actions: 1) DN

Condition State 2 The element **shows deterioration** such as: **Joints in the rock are open** < 1/2" in width, **water leakage**, and **no loose rocks**.

Feasible actions: 1) DN
2) Control water

Condition State 3 The element shows **Moderate deterioration** such as: **Joints in the rock are open** > 1/2" in width, **water leakage**, or **loose rocks** < 1", water leakage, loose rocks > 1' in diameter. **Serviceability is affected and warrants further investigation**.

Feasible actions: 1) DN
2) Control water
3) Minor repair

Condition State 4 The element shows **Severe deterioration** such as: **Joints in the rock are open** > 1", **water leakage**, **loose rocks** > 1' in diameter, **small rocks falling onto the roadway or minor cave-ins**.

Feasible actions: 1) DN
2) Control water
3) Minor repair

Units: LF Along Centerline Note: If a timber or steel set or rock bolt fails, the LF reported will be from adjacent good sets or rock bolts on either side.

This element defines the unlined portion of tunnels supported by timber or steel sets or rock bolts only, backing boards or planks and cribbing behind the sets or wire mesh in conjunction with rock bolts and may have leaking water. Report the quantity of Condition States 2 through 4.

Condition State 1 This element shows **minimal deterioration** such as: **Minor checking in the timber sets, no deformation of the steel sets or loose rock bolts.**

Feasible actions: 1) DN

Condition State 2 This element shows **deterioration** such as: **Checking, splitting, some flanges may be locally bent on the steel sets** but they are not deformed, **rock bolts are still tight, minor rock sloughing** behind or between the sets or cribbing.

Feasible actions: 1) DN
2) Minor repair

Condition State 3 This element shows **moderate deterioration** such as: **Crushing of timber sets, steel sets have some locally bent flanges** but **sets are not deformed, rock bolts are still tight**, cribbing is loose or falling out and **considerably rock sloughing** behind the cribbing or **small rocks are falling onto the roadway.**

Feasible actions: 1) DN
2) Major repair

Condition State 4 This element shows **severe deterioration** such as: **Failure of timber sets, deformation of the steel sets, loose rock bolts, rocks falling onto the roadway.**

Feasible actions: 1) DN
2) Major repair
3) Replace

Units: LF Along Centerline

This element defines the shotcrete lined portion of tunnels only, may or may not have rock bolts and wire mesh reinforcement. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **minimal deterioration** such as: **Light cracking in the shotcrete** with or without efflorescence stains, **minimal water leakage**.

Feasible actions: 1) DN

Condition State 2 The element **shows deterioration** such as: **Cracks in the shotcrete** < 1/2" in width, **efflorescence, stalactites, delaminations, spalls, or water leakage**. **Efflorescence** on the lining surface is **light to severe**, but affects **less than 10% of lining area**.

Feasible actions: 1) DN
2) Control water
3) Minor repair

Condition State 3 The element shows **moderate deterioration** such as: 1/2" < **cracks in the shotcrete** < 1" in width, **efflorescence, delaminations, spalls, loose rocks** < 1' in diameter, or **water leakage**. **Efflorescence** on the lining surface is **light to severe**, but affects **10% to 25% of lining area**.

Feasible actions: 1) DN
2) Control water
3) Repair

Condition State 4 The element shows **severe deterioration** such as: **Cracks in the shotcrete** > 1" in width, **efflorescence, delaminations, spalls, loose rocks** > 1' in diameter, or **water leakage**. **Efflorescence** on the lining surface is **light to severe**, but affects **more than 25% of lining area**.

Feasible actions: 1) DN
2) Control water
3) Major repair

SmartFlag Index

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Units: Each

This SmartFlag defines the steel intermediate and end diaphragms in steel or prestressed/precast concrete girder bridges. Report only the quantity of diaphragms that meet Condition States 1 through 3.

CDOT Notes: Retain this SmartFlag even though repairs have been made.

Include comments concerning damage to diaphragm members with the appropriate girder element.

Condition State 1 The bolts in the connections have been replaced or have been tightened. All welded connections are still sound including the welded stiffener connection to the web.

Condition State 2 There are loose or missing bolts in the connections and the connections are loose. The welded connections, including the welded stiffener connection to the web, are basically sound but there may be visible cracks (< 1/2" in length) in the weld.

Condition State 3 There are loose and missing bolts in the connections, and the diaphragm is ineffective. There is distress in the welded connections or the welded stiffener connection to the web (fatigue cracks or broken welds).

Units: Each

This SmartFlag exists only on those **bridges with steel elements which are already showing fatigue damage**. It should not be applied to steel bridges prior to fatigue damage becoming apparent. Once established, deterioration modeling can be used to obtain transition probabilities.

CDOT Notes: Retain this SmartFlag once repairs are made.

Condition State 1 **Fatigue damage to the bridge has been repaired or arrested.** The bridge may still be fatigue prone.

Condition State 2 **Fatigue damage exists** which is not arrested (normally, this condition state would be used the first time the condition is identified and at any other time when additional fatigue damage occurs.)

Condition State 3 **Fatigue damage exists which warrants analysis** of the element to ascertain the serviceability of the element or bridge.

Units: Each

This SmartFlag **defines only those connections** (including shapes in contact in built-up members) of steel bridges which are **already showing signs of rust packing** between steel plates **as in trusses, riveted plate girders and cover plates.**

CDOT Note: The "Each" unit is defined as a location; 20 locations equals a quantity of 20. If there are many locations on a member, estimate a quantity and give the general locations such as top or bottom flange cover plates, gusset plates on lower cord vertical connection plates, etc.

Condition State 1 The connection is **showing signs of rusting between plates.** Seams of the connections exhibit rust staining.

Condition State 2 **Rusting between plates is beginning to distress** the connection. **Minor swelling** exists.

Condition State 3 **Rusting between plates** has caused **serious distress** to the connection. The **plates may be badly distorted**, however all connectors (rivets/bolts) are still functioning.

Condition State 4 **Rusting between plates** has caused **serious distress to the connection which warrants analysis** of the bridge to ascertain the impact on the serviceability of the bridge. Some rivets or other connectors may have popped or are no longer effective.

Units: Each

This condition state language addresses deck cracking. Once a deck begins to show other distress more significant than cracking (spalling/delamination) the status of this SmartFlag is probably not important.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN ASPHALT SURFACING						
SPACING (S) IN METERS (FEET)						
W	I		S > 3 M	2 < S ≤ 3	1 < S ≤ 2	S < 1 M
I	N		(10 ft)	(6) (10)	(3) (6)	(< 3 ft)
D		≤ 3 mm	1	1	2	3
T	mm	(≤ 1/8 in)				
H	(in)	3 < W ≤ 6	1	2	3	4
(W)		(1/32)(1/16)				
		6 < W ≤ 10	2	3	4	4
		(1/4)(3/8)				
		> 10 mm	3	3	4	4
		(> 3/8 in)				

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN CONCRETE DECK						
SPACING (S) IN METERS (FEET)						
W	I		S > 3 M	2 < S ≤ 3	1 < S ≤ 2	S ≤ 1 M
I	N		(> 10 ft)	(6)(10)	(3)(6)	(< 3 ft)
D		≤ 1 mm	1	1	2	3
T	mm	(≤ 1/32 in)				
H	(in)	1 < W ≤ 2	1	2	3	4
(W)		(1/32)(1/16)				
		2 < W ≤ 3	2	3	4	4
		(1/16)(1/8)				
		> 3 mm	3	3	4	4
		(> 1/8 in)				

CDOT Note: This SmartFlag shall not be used when the condition state of the deck element is worse than Condition State 1.

Condition State 1 The **surface of the deck is cracked**, but the cracks are **either filled/sealed or insignificant in size and density** to warrant repair activities.

Condition State 2 **Unsealed cracks** exist which are of **moderate size or density**.

Condition State 3 **Unsealed cracks** exist in the deck which are of **moderate size and density**.

Condition State 4 **Unsealed cracks** exist in the deck which are **severe size and/or density**.

Units: Each

This condition state language addresses deck distresses through visual inspection of the deck soffit (under-surface). It is extremely valuable when the top surface of the deck is covered with an overlay.

CDOT SUGGESTED CONDITION STATES FOR SmartFlag 359 - BOTTOM OF DECK			
Cracking/Efflorescence	Rust Stain/Spalling	% of Total Deck Area	Condition State
Light to severe	none	< 10%	2
Light to severe	none	10% < TDA ≤ 25%	3
Light to severe	Light to moderate	> 25%	4
Light to severe	Heavy to severe	> 25%	5

CDOT Notes: Do not use with timber deck or slab, steel decks or Element 60 Deck - Railroad.

This SmartFlag is generally not used when there are stay-in-place deck forms or when the soffit of the deck or slab is not visible.

Condition State 1 The under-surface of the deck or slab has no symptoms of distress. Any cracking that is present is only superficial.

Condition State 2 The under-surface of the deck or slab shows no evidence that active corrosion is occurring in the deck (There is no rust staining or spalling which could be attributed to active corrosion). However, the cracking and/or efflorescence on the under-surface is light to moderate. CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects less than 10% of deck area.

Condition State 3 The under-surface of the deck or slab shows no evidence that active corrosion is occurring in the deck (There is no rust staining or spalling which could be attributed to active corrosion). However, the cracking and/or efflorescence on the under-surface is heavy to severe. CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects 10% to 25% of deck area.

Condition State 4 Light to moderate rust staining and/or spalling on the under-surface of the deck indicates that active corrosion is occurring in the deck. CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects more than 25% of deck area.

Condition State 5 Heavy to severe rust staining and/or spalling on the under-surface of the deck indicates that active corrosion is occurring in the deck. CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects more than 25% of deck area.

Units: Each

This condition state language addresses substructure settlement distress which is evident during visual inspections. Its' primary purpose is to identify bridges that are experiencing settlement and to provide some measure of the magnitude of that settlement. The normal CoRe condition state language for substructure elements does not address settlement.

Condition State 1 Some of the bridge supporting elements are **showing signs of visible settlement or rotation** but, due to earlier repairs or other signs, the **settlement appears to have stabilized.**

Condition State 2 **Settlement or rotation** of the bridge supporting elements **show signs of continuing** and, if left un-arrested, could **cause adverse impacts on the bridge.**

Condition State 3 Settlement or rotation of the bridge supporting elements is **significant enough to warrant analysis of the bridge.**

Units: Each

This condition state language addresses scour distresses which are evident during visual inspections. Its primary purpose is to identify bridges that are experiencing scour and to provide some measure of the magnitude of scour. This SmartFlag may not be needed provided NBI Item113 is used to record observed scour.

CDOT Note: The observed scour must be located at a substructure unit, i.e. an abutment or pier.

Condition State 1 Scour exists at the bridge site but is of little concern to the structural integrity of the bridge.

Condition State 2 Scour exists at the bridge site and if left unchecked could impact the structural integrity of the bridge.

Condition State 3 Scour is significant enough to warrant analysis of the bridge.

Units: Linear Feet

This condition state language addresses **distress** of any superstructure elements due to traffic impact.

CDOT Note: Retain this SmartFlag after the damage has been repaired but report 1' in Condition State 1. Record and retain the date(s) of each impact, inspection, and repair in the comment field for this SmartFlag as follows: IMP-MM/DD/YY, ISP-MM/DD/YY, REP-MM/DD/YY. Provide all three items of information and use a question mark for any information not known and a zero if the item has not been repaired, i.e. IMP-MM/?/YY, ISP-MM/DD/YY, REP-00/00/00.

Do not use this SmartFlag for insignificant damage, such as a scratch or minor scrape.

Condition State 1 Impact damage has occurred and **has been repaired**. Prestressing system is covered by patch concrete. Steel has been **straightened or repaired**. *CDOT Add: Damage to the timber member has been repaired or is minor.*

Condition State 2 Impact damage has occurred. **Prestressing system is exposed** but is **not impaired**. Steel strength **does not threaten the serviceability** of the bridge. *CDOT Add: Damage to the timber member does not threaten the serviceability of the bridge.*

Condition State 3 Impact has occurred and the **strength of the member is impaired**. **Analysis is warranted** to ascertain the serviceability of the bridge. *CDOT Add: Damage to the timber member warrants analysis to ascertain serviceability of the bridge.*

Units: Linear Feet

This condition state language addresses **distress** of any substructure elements due to traffic impact.

CDOT Note: Retain this SmartFlag after the damage has been repaired but report 1' in Condition State 1. Record and retain the date(s) of each impact, inspection, and repair in the comment field for this SmartFlag as follows: IMP-MM/DD/YY, ISP-MM/DD/YY, REP-MM/DD/YY. Provide all three items of information and use a question mark for any information not known and a zero if the item has not been repaired, i.e. IMP-MM/?/YY, ISP-MM/DD/YY, REP-00/00/00.

Do not use this SmartFlag for insignificant damage, such as a scratch or minor scrape.

Condition State 1 Impact damage has occurred and **has been repaired**. Prestressing system is covered by patch concrete. Steel has been **straightened or repaired**. *CDOT Add: Damage to the timber member has been repaired or is minor.*

Condition State 2 Impact damage has occurred. **Prestressing system is exposed** but is **not impaired**. Steel strength **does not threaten the serviceability** of the bridge. *CDOT Add: Damage to the timber member does not threaten the serviceability of the bridge.*

Condition State 3 Impact has occurred and the **strength of the member is impaired**. **Analysis is warranted** to ascertain the serviceability of the bridge. *CDOT Add: Damage to the timber member warrants analysis to ascertain serviceability of the bridge.*

Units: Linear Feet

This condition state language addresses **distress** of any deck elements due to traffic impact. This includes curbs, rails, but not expansion devices.

CDOT Note: Retain this SmartFlag after the damage has been repaired but report 1' in Condition State 1. Record and retain the date(s) of each impact, inspection, and repair in the comment field for this SmartFlag as follows: IMP-MM/DD/YY, ISP-MM/DD/YY, REP-MM/DD/YY. Provide all three items of information and use a question mark for any information not known and a zero if the item has not been repaired, i.e. IMP-MM/?/YY, ISP-MM/DD/YY, REP-00/00/00.

Do not use this SmartFlag for insignificant damage, such as a scratch or minor scrape.

Condition State 1 Impact damage has occurred and **has been repaired**. Prestressing system is covered by patch concrete. Steel has been **straightened or repaired**. *CDOT Add: Damage to the timber member has been repaired or is minor.*

Condition State 2 Impact damage has occurred. **Prestressing system is exposed** but is **not impaired**. Steel strength **does not threaten the serviceability** of the bridge. *CDOT Add: Damage to the timber member does not threaten the serviceability of the bridge.*

Condition State 3 Impact has occurred and the **strength of the member is impaired**. **Analysis is warranted** to ascertain the serviceability of the bridge. *CDOT Add: Damage to the timber member warrants analysis to ascertain serviceability of the bridge.*

Units: Each

This condition state language addresses the use of false bents and other temporary supports under the superstructure. These supports may be used to **temporarily** raise the load carrying capacity of the bridge or as a **temporary repair** for a superstructure or substructure element.

CDOT Note: Code NBI Item103 = T and Item41 = B, D, E, or P when this SmartFlag is used. If Item103 is coded T, then all data recorded for the structure shall be for the condition of the structure without temporary measures, except for the following items which shall be for the temporary structure:

- Item10 - Inventory Route, Minimum Vertical Clearance
- 41 - Structure Open, Posted, or Closed to Traffic
- 47 - Inventory Route, Total Horizontal Clearance
- 53 - Minimum Vertical Clearance Over Bridge Roadway
- 54 - Minimum Vertical Underclearance
- 55 - Minimum Lateral Underclearance on Right
- 56 - Minimum Lateral Underclearance on Left
- 70 - Bridge Posting

Item41 Code

- B = Open, posting recommended but not legally implemented.
- D = Open, would be posted or closed except for temporary shoring, etc. to allow for unrestricted traffic.
- E = Open, temporary structure in place to carry legal loads while original structure is closed and awaiting replacement or rehabilitation.
- P = Posted for load.

Condition State 1 The false bent/temp. support is **functioning as intended**. All components are as constructed, there is full bearing with the superstructure, and the foundation is sound.

Condition State 2 There are **some superstructure elements not bearing as intended** or constructed, the false bent/temp. support is loose and not stable, the foundation is starting to be undermined by water/wind etc.

Condition State 3 The false bent/temp. support is **no longer in contact with superstructure**, the foundation is undermined to the point of affecting its stability, it is no longer functioning as intended or constructed.

Units: Each

This SmartFlag **defines only those connections** (including shapes in contact in built-up members) of steel bridges which are **already showing signs of rust packing** between steel plates.

CDOT Notes: This includes steel bearings, not sole plates on poured in girders.

The "Each" unit is defined as a location; 20 locations equals a quantity of 20. If there are many locations on a member, estimate a quantity and give the general locations such as top or bottom flange cover plates, gusset plates on lower cord vertical connection plates, etc.

Condition State 1 The connection is **showing signs of rusting between plates**. Seams of the connections exhibit rust staining.

Condition State 2 **Rusting between plates is beginning to distress** the connection. **Minor swelling** exists.

Condition State 3 **Rusting between plates** has caused **serious distress** to the connection. The **plates may be badly distorted**, however all connectors (rivets/bolts) are still functioning.

Condition State 4 **Rusting between plates** has caused **serious distress to the connection which warrants analysis** of the bridge to ascertain the impact on the serviceability of the bridge. Some rivets or other connectors may have popped or are no longer effective.

Units: Sq. Ft.

The condition states for this SmartFlag identify the individual concrete components of the bridge i.e., Deck, Superstructure, Substructure, and Wingwalls.

Use the following condition states to identify the component with **suspected ASR**. Record the **estimated Square Feet** in the appropriate condition state. The Total Quantity is the sum of quantities in Condition States 2 through 5 and can be as large as 99999. The quantity in **Condition State 1 will be ignored**.

Condition State 2 = Deck (deck, curbs, sidewalks, rails etc.)

Condition State 3 = Superstructure

Condition State 4 = Substructure (abuts., piers, caps,
columns/piling)

Condition State 5 = Wingwalls

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Remaining Element Index

501*- Channel Condition
502*- Channel Protection Material and Condition
504*- Bank Condition
505*- Debris
510*- Waterway Adequacy
520*- Approach Roadway Alignment
600*- General Remarks

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501* Channel Condition**501***
Streambed(30)**Units: N/A**

This element describes the actual physical condition of that part of the waterway that is associated with the flow of water through the bridge. A comment would normally describe conditions that might adversely affect the flow of water through the channel. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

If there are no comments for this element, do not include it in the inspection report.

502* Channel Protection Material and Condition**502***
Streambed(30)**Units: N/A**

This element describes the material used to protect the banks and streambed of the waterway in association with the bridge, but excluding the slope protection at the bridge. The comment would describe the material and the condition of the channel protection material. Use this element for **check dams, aprons, and materials used to protect the channel**. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

If there is no specific channel protection, this element should not be used.

If there are no comments for this element, do not include it in the inspection report.

504* Bank Condition**504***
Streambed(30)**Units: N/A**

This element describes the actual physical condition of the bank of the waterway that is associated with the flow of water through the bridge. A comment would normally describe conditions that might adversely affect the flow of water through the channel. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

If there are no comments for this element, do not include it in the inspection report.

Units: N/A

This element describes the debris found in and around the waterway associated with the bridge. The comment would describe the material and its location in the channel. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

If there are no comments for this element, do not include it in the inspection report.

510* Waterway Adequacy**510*****Waterway(35)****Units: N/A**

CDOT Note: GCD15 - If there are no comments for Element 510 Waterway Adequacy or Element 520 Approach Roadway Alignment, remove the elements from the report.

This element describes the appraisal of the waterway opening with respect to passage of the flow of water through the bridge. Use comments to describe this appraisal if an adverse condition exists. A condition state will not be determined however, and using the NBI definition, this condition will be used to determine the code for NBI Item71.

520* Approach Roadway Alignment**520*****Approach RWY(40)****Units: N/A**

CDOT Note: GCD15 - If there are no comments for Element 510 Waterway Adequacy or Element 520 Approach Roadway Alignment, remove the elements from the report.

This element describes the appraisal of the approach roadway alignment with respect to the existing roadway alignment. Use comments to describe this appraisal if an adverse condition exists. A condition state will not be determined however, and using the NBI definition, this condition will be used to determine the code for NBI Item72.

Units: N/A

This element is used for general remarks about the bridge, conditions in the general area of the bridge, vehicle parking, access to the bridge, existence of utilities, history of the bridge from local property owners, etc. as well as a continuation of element condition narratives. If this is used for further element narration, be sure to begin the comment with the element number you are referring to in the report.

If utilities are carried by the bridge, include the word "Utility" or "Utilities" in this element along with a brief description and the type of utility, if known. Show the utilities on the structure sketch.

Include the word "Access" followed by a brief description of where to access the bridge, any special equipment necessary (a 6' or 12' ladder, under-bridge inspection crane, etc.), lock key number, and any other information that may be helpful in order to access the bridge.